

Mistakes on Prob. review 2 answer key:

#7h) {16, 17, 18, 19, 20, 22, 23, 25, 26, 27, 28, 30}

#9) last sentence should read:

What is the probability that he brings an umbrella given that it rains?

$$P(U|R) = 0.405$$

$$\#13) (40 \text{ nCr } 4)(65 \text{ nCr } 4) (50 \text{ nCr } 4) = 1.425 \times 10^{16}$$

4.1

4.2

4.5

4.3: RANDOM VARIABLE

coin flip: H or T (non-numerical)

rolling a die: 1, 2, 3, 4, 5, 6 (numerical)
 $X = \# \text{ of evens}$

→ $X = \# \text{ of heads flipped}$
 $\{0, 1, 2, 3, \dots\}$

* function

* associate/assign numerical values
to every outcome

* Values vary in each trial

* DISCRETE

What is it?

X = have only finite # of poss. outcomes / different values.

Ex: coin flip $\times 10$
 X = # heads

Examples:

$\{0, 1, 2, 3, \dots, 9, 10\}$

Ex: # of kids in a family

Distribution/
Function:



* histogram

Properties of
 Distribution:

$$0 \leq P(X) \leq 1$$

$$\sum P(X) = 1$$

CONTINUOUS

X = take any value in an interval.

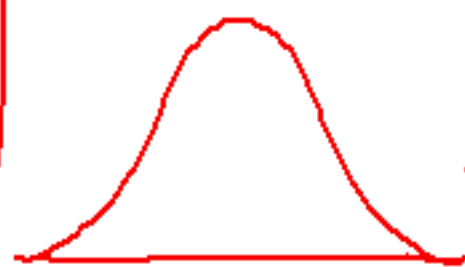
Ex: # of hrs. burned for a light bulb

$\{0 \dots \dots \text{max hrs. burned}\}$

Ex: height, wt, time

- Prob. density fctn.

* assign prob. to diff. intervals



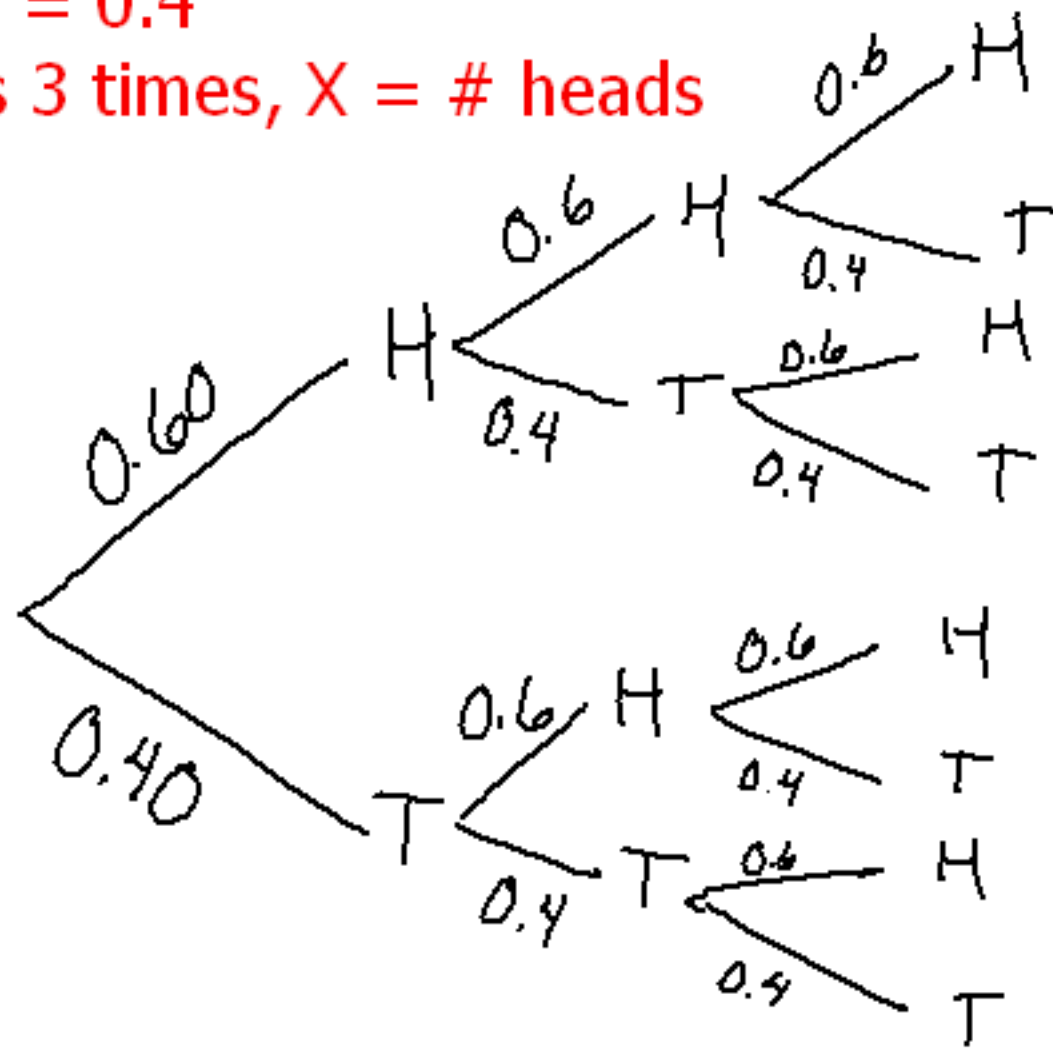
* Area = 1

Example: Unfair Coin

$$P(H) = 0.6$$

$$P(T) = 0.4$$

Toss 3 times, $X = \# \text{ heads}$



$$HHH = 0.216$$

$$HHT = 0.144$$

$$HTH = 0.144$$

$$HTT = 0.096$$

$$THH = 0.144$$

$$THT = 0.096$$

$$TTH = 0.096$$

$$TTT = 0.064$$

X	0	1	2	3
$P(X)$	1×0.064 0.064	3×0.096 0.288	3×0.144 0.432	0.216

Formula:

$$P(X=k) = \binom{n}{k} P^k (1-P)^{(n-k)}$$

outcome $\binom{n}{k}$ P^k $(1-P)^{(n-k)}$ prob. of "failure" prob. of "success"

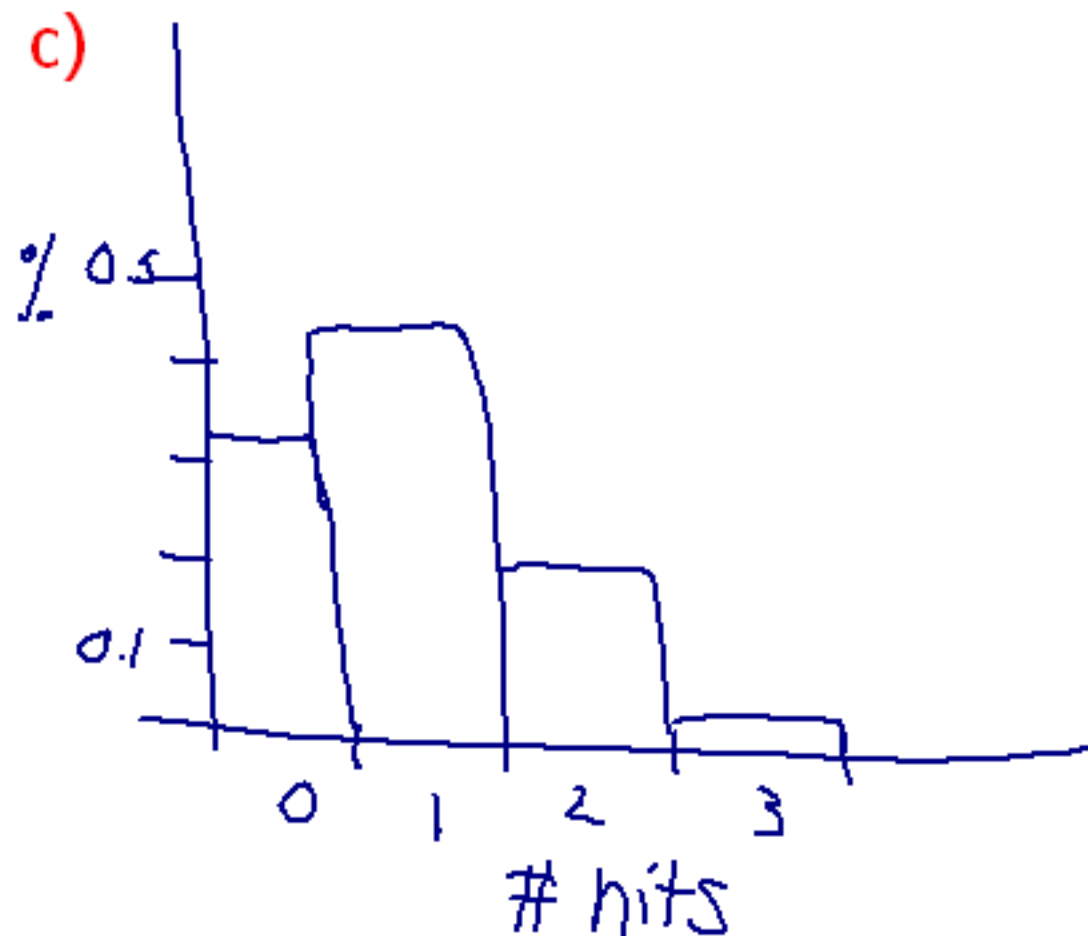
* Coin Example again:

X	$P(X)$
0	$(3nC0)(0.6^0)(0.4^3) = 0.064$
1	$(3nC1)(0.6^1)(0.4^2) = 0.288$
2	$(3nC2)(0.6^2)(0.4^1) = 0.432$
3	$(3nC3)(0.6^3)(0.4^0) = 0.216$

Worksheet 4.3

a) HHH HHO HOH OHH
HOO OHO OOH OOO

b) X P(X)
0 $(3nC0)(0.32)^0(0.68)^3 = 0.314432$
1 $(3nC1)(0.32)^1(0.68)^2 = 0.443904$
2 $= 0.208896$
3 $= 0.032768$



k) $P(X=3) = 0.032768$
 $P(X=1 \text{ or } X=2) = 0.6528$
 $P(X < 1) = 0.314432$
 $P(X > 1) = 0.241664$
 $P(X=2) = 0.208896$

Worksheet 4.3B

#1:

a)

X	P(X)
0	0.6561
1	0.2916
2	0.0486
3	0.0036
4	0.0001

$$(4nC0)(0.1^0)(0.9^4)$$

$$(4nC1)(0.1^1)(0.9^3)$$

b) $P(X \geq 2) = 0.0523$

Section 4.4: Expected Value

What is it?

Basically... a long-run average (expected/avg gain per trial)

Also called... $\mu_x = \text{mean}$

Symbols... μ_x
 $E(x)$

$$\begin{aligned} & \$0.63 \times 100 \\ & \$63 \end{aligned}$$

How to find it:

	+5	-2	+1	-1
X	X1	X2	X3...	Xn
P(X)	P(X1)	P(X2)	P(X3)	P(Xn)
	$\frac{110}{360}$	$\frac{90}{360}$...	

To find the mean:

$$\mu_x = E(X) = (X1)(P(X1)) + (X2)(P(X2)) + \dots$$

* weighted avg.

$$\begin{aligned} HW &= 0.15 \times \underline{\hspace{2cm}} \\ \text{Class} &= 0.15 \times \underline{\hspace{2cm}} \\ \text{Test} &= 0.70 \times \underline{\hspace{2cm}} \end{aligned}$$

Example:

$$\mu_x = E(x) = 2.93$$

$$(0 \times 0.05) + (1 \times 0.12) + (2 \times 0.18) + \dots$$

L_1 = outcomes/values

L_2 = prob.

L_1 x	L_2 $P(x)$

①

X	60,000	45,000	15,000
$P(X)$	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{6}$

$$\mu_x = 47,500$$

$$\sigma_x = 16,007.811$$

$$\sigma_x^2 = 256,250,013$$

2)

X	-1	$74,999$
$P(X)$	$\frac{9,999}{10,000}$	$\frac{1}{10,000}$

$$\mu_X = \$6.50$$

~~$$\sigma_X = \$749.96$$~~

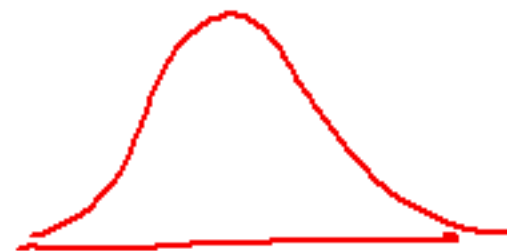
HW:

wksht 4.3 #3

p.323 #40, 46, 48



normal



normalcdf

Test thursday